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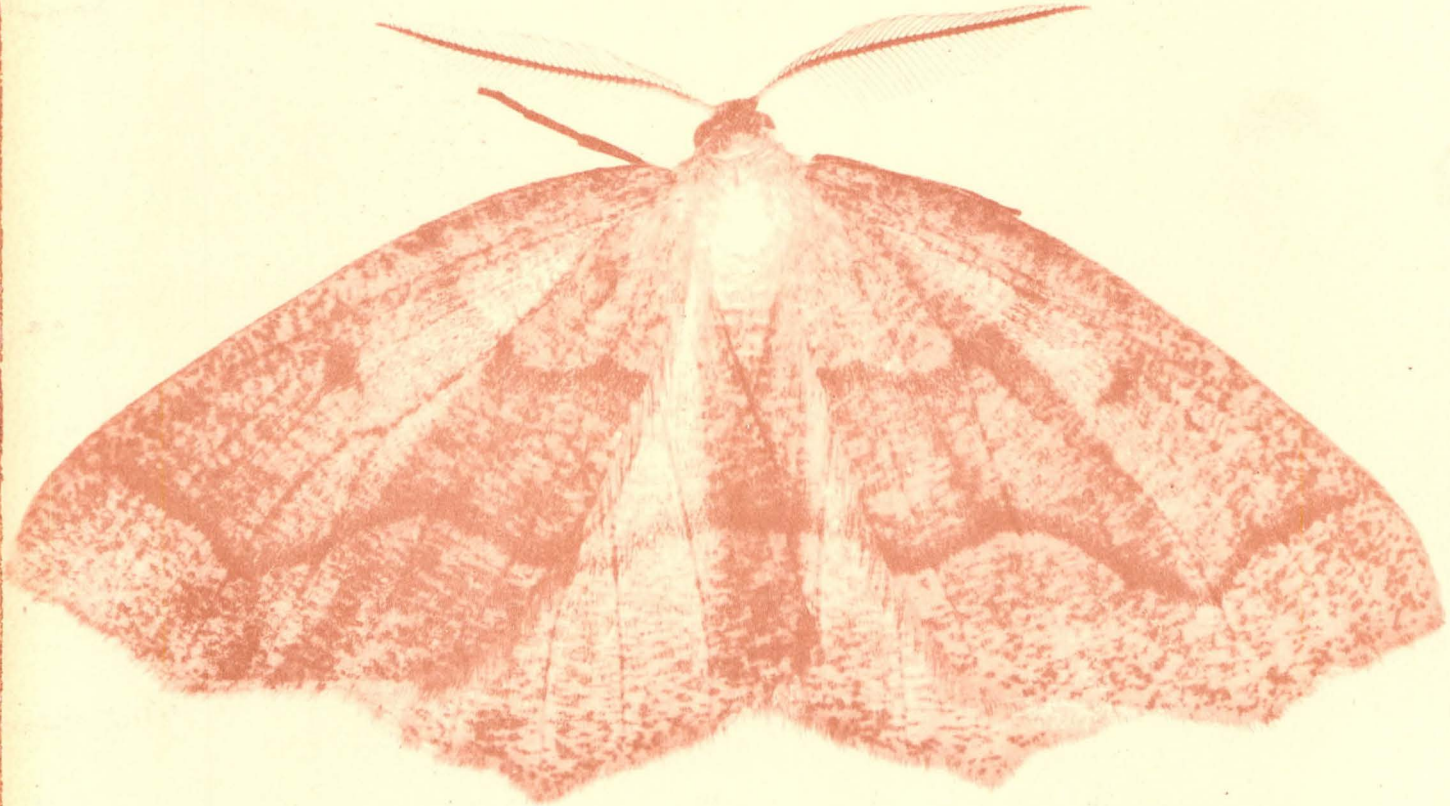
FOREST INSECT CONDITIONS

in the Pacific Northwest during 1963



by

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DIVISION OF TIMBER MANAGEMENT
PACIFIC NORTHWEST REGION
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

MARCH 1964

This is the 16th annual report of forest insect conditions in Oregon and Washington. The combined efforts of many organizations and individuals have made these surveys possible. Special acknowledgement is made to the principal cooperators: Washington State Department of Natural Resources and Oregon State Department of Forestry.

COVER BACKGROUND: Western hemlock looper adult, Lambdina fiscellaria lugubrosa Hulst.

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U. S. Department of Agriculture

C O N T E N T S

	Page
SURVEY FINDINGS IN BRIEF	1
INTRODUCTION	4
DEFOLIATORS	4
Spruce Budworm	4
Western Hemlock Looper	7
European Pine Shoot Moth	9
Larch Casebearer	10
Pandora Moth	11
Douglas-fir Tussock Moth	11
Western Tent Caterpillar	12
Pine Needle Sheath Miner	12
Western Oak Looper	13
Knobcone Pine Sawfly	13
Larch Looper	13
Unknown Sawfly on Larch	14
Douglas-fir Needle Gall Midge	14
SUCKING INSECTS	15
Balsam Woolly Aphid	15
Unidentified Mite	17
Giant Willow Aphid	17
BARK BEETLES	17
Mountain Pine Beetle	17
Douglas-fir Beetle	22
Western Pine Beetle	24
Fir Engraver	26
Oregon Pine Ips	28
Silver Fir Beetles	30
Douglas-fir Engraver Beetle	31
Engelmann Spruce Beetle	33
Twig Beetle	35
Red Turpentine Beetle	35
OTHER FOREST PROBLEMS	35
Dying Hemlock	35
Bear Damage	38

Page

APPENDIX. 40

Organization and conduct of the aerial survey. 40
Table 30. Summary of cooperative aerial survey activities in 1963 40
Table 31. Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation 41
Table 32. Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation 51

SURVEY FINDINGS IN BRIEF

Epidemic outbreaks of forest insects in the Pacific Northwest totaled 1,319,125 acres this year compared to 1,305,170 acres last year. The trend of epidemic infestations during the last decade is as follows:

Year	Acres infested	Year	Acres infested
1954	7,704,120	1959	1,448,360
1955	2,248,820	1960	1,272,960
1956	1,410,660	1961	1,223,230
1957	2,129,440	1962	1,305,170
1958	2,032,720	1963	1,319,125

The extent and intensity of the outbreaks during 1963 classified by insect species are given in the Appendix in table 31 for Oregon, and in table 32 for Washington. The general locations of the most extensive outbreaks are shown in figure 1 in the Appendix.

The prominent findings of the 1963 survey were:

1. Mountain pine beetle.--In western white pine and lodgepole pine stands, outbreaks decreased slightly in Oregon and increased considerably in Washington. Infestations in ponderosa pine decreased in Oregon and remained static in Washington.

2. Balsam woolly aphid.--Damage increased in subalpine fir, but was static in Pacific silver fir and grand fir stands.

3. Western pine beetle.--Outbreaks increased in Washington but decreased in Oregon

4. Douglas-fir beetle.--Little change in the total acreage of infestation occurred in either State. Beetle populations in windthrown timber ranged from low to high. High beetle populations in windthrow may serve as a source of serious localized tree killing in 1964.

5. Fir engraver.--The extent and intensity of damage was lighter in both States this year.

6. Silver fir beetles.--Tree killing subsided in Oregon while noteworthy infestations developed in Washington. Losses were heaviest on the Mt. Baker and Snoqualmie National Forests.

7. Oregon pine ips.--Outbreaks of this beetle decreased substantially in Oregon and increased slightly in Washington.

8. Spruce budworm.--Outbreaks in Oregon decreased. A new outbreak on the Kaniksu National Forest in Washington resulted in light to moderate defoliation. In both States the predicted damage trend is downward for 1964.

9. Western hemlock looper.--Small isolated centers of defoliation were visible in northwest Oregon. In Pacific and Wahkiakum Counties, Washington, about 70,000 acres were sprayed to prevent tree killing.

10. Douglas-fir tussock moth.--The general upward trend continued in northeastern Washington where small outbreaks increased in farm woodlots and isolated timber stands. Control may be necessary on a local basis in 1964.

11. Larch casebearer.--Infestations increased causing light to severe defoliation of western larch over wide areas of northeastern Washington.

12. European pine shoot moth.--The European pine shoot moth is deeply entrenched on pines in the Puget Sound area in Washington. This is the only currently known infested area in Oregon or Washington. Infestations in Spokane, Washington and Salem, Oregon have apparently been eradicated. Infested trees were found only in a localized area in Portland, Oregon. Chances for eradication in Portland are good.

Table 1.--Summary of 1963 forest insect epidemic infestations in Oregon and Washington

Insects 1/	Oregon		Washington		Regional total	
	Infestation centers	Area	Infestation centers	Area	Infestation centers	Area
	Number	Acres	Number	Acres	Number	Acres
Defoliators:						
Spruce budworm	13	49,040	4	10,200	17	59,240
Larch casebearer	0	0	44	37,030	44	37,030
Oak looper	29	16,750	0	0	29	16,750
Western hemlock looper	6	540	20	8,040	26	8,580
Knobcone sawfly	8	7,440	0	0	8	7,440
Pandora moth	1	3,800	0	0	1	3,800
Douglas-fir tussock moth	0	0	19	1,515	19	1,515
Unknown sawfly (larch)	3	570	0	0	3	570
Contarinia sp.	2	105	0	0	2	105
All defoliators	62	78,245	87	56,785	149	135,030
Sucking insects:						
Balsam woolly aphid	196	102,145	71	85,310	267	187,455
Unknown mite (Douglas-fir) (true firs)	9	31,100	0	0	9	31,100
All sucking insects	205	133,245	71	85,310	276	218,555
Bark beetles:						
Mountain pine beetle (W)	219	67,845	366	410,545	585	478,390
Mountain pine beetle (L)	178	50,220	37	17,620	215	67,840
Mountain pine beetle (P)	262	32,220	11	1,155	273	33,375
Western pine beetle	497	98,395	61	39,275	558	137,670
Douglas-fir beetle	310	24,545	167	60,700	477	85,245
Fir engraver	323	58,280	62	15,865	385	74,145
Silver fir beetle	0	0	46	54,840	46	54,840
Oregon pine ips	190	15,580	14	2,600	204	18,180
Engelmann spruce beetle	33	4,115	47	11,015	80	15,130
Douglas-fir engraver	6	625	3	100	9	725
All bark beetles	2,018	351,825	814	613,715	2,832	965,540
All insects	2,285	563,315	972	755,810	3,257	1,319,125

1/ Mountain pine beetle infestations are separated by tree species: W, western white pine; L, lodgepole pine; P, ponderosa pine.

INTRODUCTION

Survey procedures were the same as those used in recent years. Epidemic outbreaks were detected and mapped from the air by standard methods.[1/] The intensity of ground surveys varied from the time-consuming evaluation of spruce budworm and western hemlock looper egg populations to general verification of aerial mapping. The extent of epidemic infestations is summarized in table 1.

Highlights of the 1963 survey results are given in four major sections, under the headings: Defoliators, sucking insects, bark beetles, and other forest problems. Within each section, the important insects or problems are individually discussed. The extent, trend, and need for control of each infestation are given.

DEFOLIATORS

Standards used for sketch mapping forest defoliation damage from the air have been developed through extensive experience on the ground and from aerial observations. Standards used are as follows:

Intensity	Appearance of Defoliation
Light	Barely visible from the air.
Moderate	Top 1/4 of tree defoliated.
Heavy	Top 1/2 of tree defoliated.
Very heavy	Top 3/4 of tree defoliated, some tree killing in progress.
Dead	Complete defoliation; tree killing in general.

SPRUCE BUDWORM
Choristoneura fumiferana (Clem.)

Spruce budworm infestations continued on the Fremont and Wallowa-Whitman National Forests in Oregon, with little change in total acreage infested. On the Kaniksu National Forest in Washington, light to moderate defoliation occurred north of Newport (table 2).

1/ Wear, J. F., and Buckhorn, W. J., Organization and conduct of forest insect aerial surveys in Oregon and Washington. U. S. Forest Service, Pacific Northwest Forest and Range Experiment Station, 40 pp., illus. 1955.

The trend of infestations recorded in 1962 and 1963 is as follows:

Reporting area	1962		1963	
	Acres	Percent	Acres	Percent
Oregon:				
Fremont N.F.	42,060	87.0	37,040	62.6
Wallowa-Whitman N.F.	6,310	13.0	12,000	20.2
Oregon areas	48,370	100.0	49,040	82.8
Washington:				
Kaniksu N.F.	0	0	10,200	17.2
All areas	48,370	100.0	59,240	100.0

The spruce budworm eggs mass evaluation survey this year showed a static to downward trend of 1964 populations in all areas.[2/] Population trends and defoliation levels predicted by area are as follows:

Kaniksu National Forest--Populations will continue at a low level in 1964. Some light defoliation may occur.

Wallowa-Whitman National Forest--Populations are expected to be at a very low level in 1964. Only very light defoliation should occur.

Fremont National Forest--1963-1964 larval populations will be very low. Very light defoliation is predicted for 1964.

On the basis of this survey, no control action is contemplated in either Oregon or Washington in 1964.

2/ Buffam, Paul E., Evaluation of 1963-64 spruce budworm populations in Oregon and Washington. U. S. Forest Service, 5 pp., October 1963.

Table 2.--Extent of spruce budworm infestations in Oregon and Washington in 1963 by reporting area and intensity of infestation

Reporting area	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	All intensities
	Number	----- Acres -----			
Oregon:					
Fremont N.F.					
Gearhart Mtn. Unit	5	23,600	0	0	23,600
Warner Mtn. Unit	7	13,440	0	0	13,440
Total	12	37,040	0	0	37,040
Wallowa-Whitman N.F.					
Snake Unit	1	9,640	2,360	0	12,000
Total All Units	13	46,680	2,360	0	49,040
Washington:					
Kaniksu N.F.					
Newport Unit	4	6,480	3,720	0	10,200
Total All Units	4	6,480	3,720	0	10,200
Regional Total	17	53,160	6,080	0	59,240

1/ N.F., National Forest; Mtn., Mountain

WESTERN HEMLOCK LOOPER
Lambdina fiscellaria lugubrosa Hulst

The trend of western hemlock looper outbreaks was strongly downward in Oregon and upward in Washington (table 4). The increase in infested acreage in Washington was due to the low larval mortality on certain parts of a control project and because some infested areas were excluded from the spray project for use as study areas. Heaviest and most severe infestations occurred in southwestern Washington (table 3). The trend of the 1964 feeding larval population will be downward in both States.[3/] [4/]

Western hemlock looper populations reached critical proportions on 70,000 acres of western hemlock in Pacific and Wahkiakum Counties, Washington. This infestation was sprayed from the air by helicopter to prevent widespread defoliation and heavy tree killing. Part of the infested area was sprayed with Sevin and part was sprayed with DDT. Some of the areas sprayed with Sevin were later resprayed with DDT because the larval mortality caused by Sevin was very inadequate in areas supporting high looper populations. Concurrently with the control project, field tests were made to determine the effectiveness of Sevin, Phosphamidon and *Bacillus thuringiensis*. DDT was the standard used.

Insecticide	Origin	Larval Mortality (Pct)
DDT	Chlorinated hydrocarbon	95-100
Phosphamidon	Organo-phosphate	89-93
Sevin	Carbamate	85-87
Bacillus thuringiensis	Bacterium	0-60

Sevin and Phosphamidon produced marginal larval mortality in the formulations and application rates used. *Bacillus thuringiensis* produced only slightly more than normal larval mortality. None could be recommended for operational use without further testing.

3/ Buffam, Paul E., Results of the 1963-64 western hemlock looper egg survey in western Washington, U. S. Forest Service. (In press).

4/ Buffam, Paul E., Results of the 1963-64 western hemlock looper egg survey in northwest Oregon, U. S. Forest Service. (In press).

Table 3.--Extent of defoliation caused by the western hemlock looper in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of defoliation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
N.W. Oregon (O.S.D.F.)	6	200	0	340	0	540
Washington:						
S.W.Washington (W.S.D.N.R.)	20	3,960	1,360	2,280	440	8,040
Regional total	26	4,160	1,360	2,620	440	8,580

Table 4.--Trend of western hemlock looper infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic defoliation: Oregon	Washington	Regional total
1961	11,000	0	11,000
1962	1,060	5,990	7,050
1963	540	8,040	8,580

1/ O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Natural Resources.

EUROPEAN PINE SHOOT MOTH
Rhyacionia buoliana (Schiff.)

In 1962, the Northwest Forest Pest Action Council recommended that: (1) A containment zone be established in a portion of northwest Washington to restrict spread of European pine shoot moth infestations; (2) within this zone no eradication should be attempted, but voluntary control should be encouraged; and (3) outside the containment zone, eradication of infested trees should be done. Such a zone was established in 1960. Within the zone, spread of the infestation has been rapid. This year new infestations were found in 25 additional communities.

Outside the containment zone in Washington, detection surveys were made in 42 communities this year but no infestations were found. The eradication survey in Spokane, Washington was continued in 1963. For the second successive year no infestations were found, indicating that the eradication program of 1961 may have been successful. If no infestations are found in Spokane, Washington in 1964, eradication efforts will be considered successful.

In Oregon detection surveys were made in 28 communities outside the metropolitan Portland area. No infestations were discovered. Eradication surveys continued in Portland, Oregon. Eight infested trees were found and destroyed. Since the infested trees were found only in a localized area, chances for eradication are good. These eradication surveys will be continued in 1964. If the moth is not found in Salem, Oregon in 1964, eradication in that City will be considered successful.

Infestations were found on both ornamental pines and native ponderosa pine in the Okanagan Valley of British Columbia. This important discovery marks the first time the shoot moth has attacked ponderosa pine growing within its natural range.

Methods are available for fumigating pine in bundles, as container stock, or as liners in place. This fumigating procedure together with strict enforcement of existing quarantines will do much to slow the spread of the moth in the Pacific Northwest.

LARCH CASEBEARER
Coleophora laricella (Hübner)

Since the first aerial detection in 1960 in northeast Washington, epidemic outbreaks of the larch casebearer have continued to spread throughout western larch stands (table 5). This year, light to extreme defoliation occurred from Mica Peak north to Newport and from the Idaho border west to Deer Park. No outbreak of the casebearer has been found in the State of Oregon.

Western larch can withstand considerable defoliation without serious injury or death to the tree. No known tree mortality has occurred as a result of defoliation by the casebearer in Washington. Generally, the trees defoliated early in the year put out new foliage when the larvae finish feeding. No major control projects are planned for 1964. However, Malathion applied at the rate of one-half pound per acre has given good control of the casebearer in Idaho.[5/] Use of this insecticide applied by ground sprayers may be desirable on ornamentals around homes.

Table 5.--Trend of epidemic larch casebearer infestations in Stevens, Pend Oreille, and Spokane Counties, Washington, 1960-63

Year of detection	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Acres				
1960	1,920	0	0	0	1,920
1961	0	0	0	0	0
1962	2,720	2,560	0	0	5,280
1963	21,940	3,750	6,440	4,900	37,030

5/ Tunnock, Scott, Preliminary tests with Lindane, Malathion, and DDT insecticides applied by helicopter to control the larch casebearer in Idaho. U. S. Forest Service, 9 pp., May 1962.

PANDORA MOTH
Coloradia pandora Blake

Second year larvae caused light to heavy defoliation of lodgepole pine and ponderosa pine on Skookum Butte on the Winema National Forest, near Chemult, Oregon. A total of 3,800 acres was infested in 1963. Elsewhere on the Winema National Forest larvae were common but not abundant. This outbreak on Skookum Butte is the first damage in recent years severe enough to be seen from the air. Subepidemic larval populations continued in an old center of infestation near Sisters, Oregon.

The 1964 population trend is undetermined. Larval diseases and pupal predators--mostly chipmunks and ground squirrels--destroy large numbers of the insect. The need for control measures will be determined in the summer of 1964 after the adults emerge, mate, and lay eggs.

DOUGLAS-FIR TUSSOCK MOTH
Hemerocampa pseudotsugata McD.

Infestations ranging in size from a few trees to several acres continued to increase throughout northeastern Washington. Most of the centers, located in Spokane, Pend Oreille, Lincoln, and Stevens Counties, were limited to farm woodlots or other isolated timber stands (table 6). One small center of moderate intensity developed as far north as Curlew, Washington in Ferry County. Defoliation varied from light to severe with considerable tree killing in some cases. Much of the tree mortality occurred in the understory. Additional infestation centers can be expected next year. Spread of the moth is rapid. Egg masses are often moved from place to place on farm vehicles, fence posts, and on other objects. Also, the young larvae are very buoyant and can be carried long distance by air currents.

Several woodlot owners sprayed their infested stands in 1963; however, no major control project was undertaken. In 1964, some infested woodlots may be sprayed by the landowner. Malathion or DDT are recommended for control of the moth in northeast Washington.6/

The development of this insect and the current outbreak will be followed closely so that widespread controls can be applied if necessary.

6/ McComb, David, Insecticide application for Douglas-fir tussock moth control, U.S. Forest Service, 3 pp., February 1964.

Table 6.--Extent of Douglas-fir tussock moth infestations in Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
N. E. Washington (W.S.D.N.R.)	15	535	290	30	315	1,170
Colville N.F.	2	0	280	0	0	280
Kaniksu N.F.	2	35	0	0	30	65
Total	19	570	570	30	345	1,515

1/ W.S.D.N.R., Washington State Department of Natural Resources; N.F., National Forest

WESTERN TENT CATERPILLAR
Malacosoma pluvialis (Dyar)

Local epidemics developed in western red alder stands in western Washington and northwestern Oregon. No control is needed in 1964, since outbreaks generally subside without doing serious lasting damage.

PINE NEEDLE SHEATH MINER
Zellaria haimbachi (Busck)

Defoliation caused by this small moth is more widespread this year. Subepidemic damage was particularly conspicuous on ponderosa and lodgepole pine growing in forest stands. Extensive defoliation was also common on a number of ornamental pine species. However, no tree mortality has occurred. Control will not be needed in 1964.

WESTERN OAK LOOPER
Lambdina fiscellaria somniaria (Hulst)

Defoliation of Oregon white oak and Oregon ash near Monmouth, Dallas, Sheridan, Willamina, and other widely scattered areas in the Willamette Valley of Oregon increased considerably in 1963. Disease wiped out populations in some areas but elsewhere the larvae completed their development apparently unaffected. Many of the trees refoliated late in the season when larval feeding was completed.

The trend is variable, presumably upward in the mid-Willamette Valley area and downward in the northern Willamette Valley. Epidemic outbreaks of this insect generally subside without causing lasting damage to the tree. Hence, control is not necessary to protect the stands in 1964.

KNOBCONE PINE SAWFLY
Neodiprion fulviceps complex

For the second year, localized outbreaks of this sawfly caused defoliation of knobcone pine and ponderosa pine near Thorn Prairie on Thorn Mountain, and in the Deer Creek drainage on the Umpqua National Forest in Oregon. Defoliation ranged from light to extreme but no tree mortality has yet occurred. Starvation or disease has caused considerable larval mortality in the knobcone pine stands.

The trend is apparently downward on knobcone pine and static on ponderosa pine. No control is needed in 1964.

LARCH LOOPER
Semiothisa sexmaculata (Pack.)

Outbreaks on western larch in northeastern Washington near Northport flared up again after a year's absence and caused some light defoliation. This outbreak is in the same general area as the one that occurred in 1961.

The trend of this year's population is undetermined. No control is needed in 1964. Western larch can evidently stand several seasons of defoliation before damage becomes critical.

UNKNOWN SAWFLY ON LARCH

Defoliation of western larch stands in the Lostine River and Bear Creek drainages, Wallowa-Whitman National Forest, Oregon, continued for the second year. An upward trend is indicated by the substantial increase in infested acreage as well as the additional number of new centers that developed.

DOUGLAS-FIR NEEDLE GALL MIDGE
Contarinia sp.

The damage to Douglas-fir in Oregon by this insect decreased considerably. Old centers of heavy damage on the Wallowa-Whitman National Forest near Sparta and on the Malheur National Forest in the Canyon Creek drainage declined. New, small centers of very light damage developed northwest of La Grande on the Wallowa-Whitman National Forest, and near Emigrant Springs State Park. Serious outbreaks were reported on Douglas-fir at Pullman, Whitman County, Washington. Also, subepidemic infestations occurred at many widely-reported areas in both States. This insect has not yet killed any trees. However it does make the attacked trees valueless for the Christmas tree market. The present trend of infestations appears to be downward.

BALSAM WOOLLY APHID
Chermes piceae (Ratz.)

Epidemic infestations of the balsam woolly aphid increased markedly in both States along the Cascade Mountains (table 7). Increased tree killing was most noticeable in subalpine fir stands on the Willamette, Deschutes, and Umpqua National Forests in Oregon and on the Gifford Pinchot, and Snoqualmie National Forests and Yakima Indian Reservation in Washington (table 8). Tree mortality in Pacific silver and grand fir stands was static to slightly upward in both States. The balsam woolly aphid is now well established on true firs in the upper Rogue River drainages in Oregon.

Colonization of imported aphid predators was continued by entomologists of the Pacific Northwest Forest and Range Experiment Station. Five species of foreign predators have become established but their effectiveness in controlling aphid populations is unknown.

Table 7.--Trend of balsam woolly aphid infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestations: Oregon	Washington	Regional total
1960	66,440	760	67,200
1961	78,080	2,320	80,400
1962	51,800	4,710	56,510
1963	102,145	85,310	187,455

Table 8.--Extent of balsam woolly aphid infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Willamette N.F.	94	37,445	6,395	870	0	44,710
Deschutes N.F.	50	14,120	4,435	860	220	19,635
Umpqua N.F.	7	10,060	1,280	490	0	11,830
Mt. Hood N.F.	23	9,180	690	0	0	9,870
Rogue River N.F.	2	5,970	410	220	0	6,600
Siuslaw N.F.	8	4,030	0	0	0	4,030
Warm Springs I.R.	8	3,180	200	0	0	3,380
Crater Lake N.P.	3	1,680	0	0	0	1,680
Winema N.F.	1	410	0	0	0	410
Oregon areas	196	86,075	13,410	2,440	220	102,145
Washington:						
Gifford Pinchot N.F.	36	59,735	4,120	80	0	63,935
Snoqualmie N.F.	25	9,360	1,200	0	0	10,560
Yakima I.R.	2	5,480	680	800	0	6,960
Mt. Rainier N.P.	6	2,935	320	0	0	3,255
Wenatchee N.F.	2	600	0	0	0	600
Washington areas	71	78,110	6,320	880	0	85,310
Regional total	267	164,185	19,730	3,320	220	187,455

1/ N.F., National Forest; I.R., Indian Reservation; N.P., National Park.

UNIDENTIFIED MITE

An unidentified mite caused light to heavy damage to true fir and Douglas-fir stands over a wide area near Sled Springs Guard Station in the northern portion of the Wallowa-Whitman National Forest.

While tree killing is not anticipated by this mite, continued defoliation may weaken the trees so that they will become attractive to bark beetles. The trend of infestation is not known but will be followed closely.

Control is not planned for 1964.

GIANT WILLOW APHID
Lachnus salignus (Gm.)

Large colonies of the giant willow aphid were abundant on native and ornamental willows at various points in the Willamette Valley of Oregon and in southern Washington. Chances are that lasting damage will not result from the attacks. Control is unnecessary in 1964. Some homeowners may wish to control the outbreaks on their ornamentals. Malathion or Diazinon sprays are effective.

BARK BEETLES

MOUNTAIN PINE BEETLE
Dendroctonus monticolae Hopk.

Regionwide, the total infested acreage in western white pine, lodgepole pine, and ponderosa pine increased considerably (table 9). Heavy tree killing resulted at several localities. The situation by tree species is as follows:

Western white pine.--Most of the damage, as well as most of the infested acreage increase, developed in western white pine stands in both Oregon and Washington (table 10). In Oregon the majority of this year's damage was centered on the Mt. Hood, Willamette, Umpqua, and Deschutes National Forests. Substantial increases in tree killing occurred only on the Mt. Hood and Deschutes National Forests.

Most of the increase in tree killing in Washington occurred on the Wenatchee and Mt. Baker National Forests and in Olympic National Park. However, all Forests in the Cascade Range and on the Olympic Peninsula sustained considerable tree killing. Tree killing in western white pine stands is increasing in both States.

Lodgepole pine.--Mortality in lodgepole pine decreased slightly in Oregon and increased in Washington resulting in a static overall loss (table 9). Heaviest losses occurred on the Winema, Fremont, and Deschutes National Forests in Oregon and on the Gifford Pinchot, Colville, and Okanogan National Forests in Washington (table 11).

Ponderosa pine.--Attacks in young ponderosa pine stands increased considerably in Oregon. Principle losses were centered on the Wallowa-Whitman, Fremont, and Umatilla National Forests. In Washington, low level losses occurred on the Wenatchee, Umatilla, and Colville National Forests (table 12).

Control.--Control is impractical in western white pine in the Cascade Mountains of Oregon and Washington because of the prevalence of blister rust. In and around outbreak centers, salvage of infested and intermingled green pines of merchantable size is encouraged to reduce beetle populations and salvage timber values.

Maintenance control of the beetle in lodgepole pine stands was done in Crater Lake National Park in 1963. Control in the Park will be done as necessary in 1964.

Thinning young stagnated ponderosa pine stands to relieve competition and improve tree vigor is recommended in both States.

Table 9.--Trend of mountain pine beetle infestations in Oregon and Washington, by host species, 1960-63[1/]

(In acres)

Year of detection	Area of epidemic infestations							Regional total, all species
	Oregon				Washington			
	W	L	P	S	W	L	P	
1960	31,040	40,080	14,520	480	209,400	6,440	4,740	306,700
1961	114,380	77,680	16,640	0	291,760	1,520	1,200	503,180
1962	73,720	65,200	3,820	160	349,770	3,050	1,345	497,065
1963	67,845	50,220	32,220	0	410,545	17,620	1,155	579,605

1/ Host species are: W, western white pine; L, lodgepole pine; P, ponderosa pine; S, sugar pine.

Table 10.--Extent of mountain pine beetle in western white pine in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Mt. Hood N.F.	57	20,880	9,910	7,860	1,120	39,770
Willamette N.F.	122	15,050	4,970	2,480	0	22,500
Umpqua N.F.	25	1,865	1,230	260	0	3,355
Deschutes N.F.	11	1,525	0	0	0	1,525
Winema N.F.	3	615	0	0	0	615
Warm Springs I.R.	1	80	0	0	0	80
Oregon areas	219	40,015	16,110	10,600	1,120	67,845
Washington:						
Olympic N.P.	31	71,800	37,640	5,040	120	114,600
Gifford Pinchot N.F.	77	42,530	37,040	15,720	3,040	98,330
Wenatchee N.F.	97	41,080	24,805	11,280	2,120	79,285
Mt. Baker N.F.	49	20,570	18,890	3,600	0	43,060
Snoqualmie N.F.	67	19,050	10,605	2,285	120	32,060
Olympic N.F.	11	6,240	15,360	1,480	520	23,600
Mt. Rainier N.P.	17	5,620	1,720	2,400	0	9,740
Quinault I.R.	7	6,600	440	0	0	7,040
Kaniksu N.F.	3	250	1,040	0	0	1,290
Okanogan N.F.	2	1,005	0	0	0	1,005
Yakima I.R.	5	445	0	90	0	535
Washington areas	366	215,190	147,540	41,895	5,920	410,545
Regional total	585	255,205	163,650	52,495	7,040	478,390

1/ N.F., National Forest; I.R., Indian Reservation; N.P., National Park.

Table 11.--Extent of mountain pine beetle in lodgepole pine in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Winema N.F.	54	11,240	4,865	360	590	17,055
Fremont N.F.	19	7,730	2,530	2,510	620	13,390
Deschutes N.F.	22	6,690	2,700	940	0	10,330
Wallowa-Whitman N.F.	25	1,760	710	170	0	2,640
Umpqua N.F.	4	250	1,200	180	560	2,190
Umatilla N.F.	14	1,800	225	0	0	2,025
Crater Lake N.P.	23	1,180	0	0	0	1,180
Malheur N.F.	9	290	160	160	0	610
Rogue River N.F.	2	360	0	0	0	360
Willamette N.F.	4	355	0	0	0	355
Warm Springs I.R.	2	85	0	0	0	85
Oregon areas	178	31,740	12,390	4,320	1,770	50,220
Washington:						
Gifford Pinchot N.F.	3	4,680	640	3,640	0	8,960
Colville, N.F.	9	520	1,160	2,680	0	4,360
Okanogan N.F.	5	1,200	0	0	0	1,200
Yakima I.R.	4	635	0	0	120	755
Olympic N.F.	4	160	520	0	0	680
Kaniksu N.F.	2	600	0	0	0	600
Colville I.R.	2	280	200	0	0	480
Wenatchee N.F.	4	345	45	0	0	390
Umatilla N.F.	4	195	0	0	0	195
Washington areas	37	8,615	2,565	6,320	120	17,620
Regional total	215	40,355	14,955	10,640	1,890	67,840

1/ N.F., National Forest; N.P., National Park; I.R., Indian Reservation.

Table 12.--Extent of mountain pine beetle in ponderosa pine in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	91	7,840	7,545	2,700	600	18,685
Fremont N.F.	38	2,875	1,445	645	0	4,965
Umatilla N.F.	36	2,645	440	0	0	3,085
Malheur N.F.	39	1,425	335	0	0	1,760
Rogue River N.F.	12	460	480	0	0	940
Umpqua N.F.	6	590	240	0	0	830
Ochoco N.F.	20	700	0	0	0	700
Central Ore. (O.S.D.F.)	13	665	0	0	0	665
Deschutes N.F.	4	195	40	40	0	275
Warm Springs I.R.	1	160	0	0	0	160
Winema N.F.	2	155	0	0	0	155
Oregon areas	262	17,710	10,525	3,385	600	32,220
Washington:						
Wenatchee N.F.	1	520	0	0	0	520
Umatilla N.F.	8	345	90	0	0	435
Colville N.F.	2	200	0	0	0	200
Washington areas	11	1,065	90	0	0	1,155
Regional total	273	18,775	10,615	3,385	600	33,375

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry.

DOUGLAS-FIR BEETLE
Dendroctonus pseudotsugae Hopk.

Little significant change was noted in the trend of Douglas-fir beetle infestations in 1963 (table 13). In eastern Oregon, the largest and most severe outbreaks were on the Wallowa-Whitman National Forest. In western Oregon the most severe infestations were on the Umpqua and Rogue River National Forests. In Washington damage was heaviest on the Okanogan, Colville, and Wenatchee National Forests and the Colville Indian Reservation (table 14). On the westside Washington forests, tree killing was static to slightly below normal.

Although a static trend existed between 1962 and 1963, an upward trend is expected in 1964. The Douglas-fir blowdown from the October 12, 1962 windstorm is expected to add significantly to the beetle populations by providing considerable breeding sites. Past experience has shown that high beetle populations will develop in windthrown timber and may emerge to attack standing green trees. An extensive survey of broods in the down timber indicates that beetles are present in sufficient numbers to cause considerable concern. The beetle potential in blowdown is greatest in the following western Oregon Counties: Columbia, Benton, and Coos. In Washington the beetle populations are heaviest in Cowlitz and Lewis Counties.7/ An increase in small patches of light tree killing was evident over much of eastern Oregon and Washington adding to the threat of increased tree killing in 1964. Salvage of the infested trees is recommended wherever possible to reduce beetle populations.

Table 13.--Trend of Douglas-fir beetle infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestations		Regional total
	Oregon	Washington	
1960	114,160	104,440	218,600
1961	70,120	99,140	169,260
1962	26,540	55,990	82,530
1963	24,545	60,700	85,245

7/ McComb, David, Douglas-fir beetle populations in windthrow trees in Oregon and Washington in 1963. U.S. Forest Service. 1964.

Table 14.--Extent of Douglas-fir beetle infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	121	8,535	3,820	160	0	12,515
Umpqua N.F.	33	4,105	0	0	0	4,105
Rogue River N.F.	53	3,075	480	0	0	3,555
Umatilla N.F.	30	1,560	0	0	0	1,560
Ochoco N.F.	12	700	160	0	0	860
Siuslaw N.F.	19	455	85	0	0	540
Willamette N.F.	11	410	0	0	0	410
Siskiyou N.F.	8	320	0	0	0	320
Malheur N.F.	10	235	0	0	0	235
Winema N.F.	3	205	0	0	0	205
Central Ore. (O.S.D.F.)	6	110	0	0	0	110
Umatilla I.R.	2	80	0	0	0	80
Crater Lake N.P.	1	30	0	0	0	30
Warm Springs I.R.	1	20	0	0	0	20
Oregon areas	310	19,840	4,545	160	0	24,545
Washington:						
Okanogan N.F.	74	26,150	4,760	1,040	0	31,950
Colville I.R.	12	9,220	1,600	640	0	11,460
Colville N.F.	39	6,560	1,680	0	0	8,240
Wenatchee N.F.	17	3,670	200	280	130	4,280
Gifford Pinchot N.F.	4	1,800	0	80	0	1,880
Snoqualmie N.F.	5	850	0	0	0	850
Umatilla N.F.	5	335	170	0	0	505
Mt. Baker N.F.	2	400	0	0	0	400
Olympic N.P.	2	320	0	0	0	320
Yakima I.R.	1	320	0	0	0	320
Kaniksu N.F.	1	160	0	0	0	160
Olympic N.F.	2	120	0	0	0	120
Glenwood Dist. (W.S.D.N.R.)	1	90	0	0	0	90
Spokane I.R.	1	65	0	0	0	65
N.E. Wash. (W.S.D.N.R.)	1	60	0	0	0	60
Washington areas	167	50,120	8,410	2,040	130	60,700
Regional total	477	69,960	12,955	2,200	130	85,245

1/ N.F., National Forest; O.S.D.F., Oregon State Department of Forestry; I.R., Indian Reservation; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.

WESTERN PINE BEETLE
Dendroctonus brevicomis Lec.

Outbreaks of the western pine beetle decreased substantially region-wide (table 15). In Oregon, the majority of tree killing was centered on the Fremont, Malheur, Winema, and Ochoco National Forests. On the other forests losses were only slightly above normal (table 16). In Washington the bulk of the damage occurred on the Yakima Indian Reservation, Glenwood District of the Washington Department of Natural Resources, and on the Okanogan National Forest (table 16). On the Washington forests the intensity of damage ranged from light (20-25 trees per section) to moderate (50-100 trees per section).

Much of the ponderosa pine windthrown during the October 12, 1962 windstorm has been salvaged. Hence, the threat of western pine beetle buildup in this material has been largely abated. In 1964 some localized tree killing may occur around centers of windthrown trees that have not yet been removed.

Losses caused by the western pine beetle can be reduced by aggressive sanitation-salvage logging programs, particularly in uncut stands.

Table 15.--Trend of western pine beetle infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	142,520	18,300	160,820
1961	180,040	12,760	192,800
1962	392,385	6,380	398,765
1963	98,395	39,275	137,670

Table 16.--Extent of western pine beetle infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Fremont N.F.	88	25,110	10,595	7,080	1,120	43,905
Malheur N.F.	136	11,015	3,780	0	0	14,795
Winema N.F.	44	8,090	2,255	2,815	0	13,160
Umatilla N.F.	43	3,885	1,180	0	0	5,065
Ochoco N.F.	61	3,020	2,020	0	0	5,040
Wallowa-Whitman N.F.	36	4,070	440	0	0	4,510
Rogue River N.F.	29	2,475	1,950	0	0	4,425
Deschutes N.F.	24	2,890	60	0	0	2,950
Mt. Hood N.F.	7	1,530	0	0	0	1,530
Umpqua N.F.	8	1,260	0	0	0	1,260
Central Ore. (O.S.D.F.)	10	510	220	0	0	730
Warm Springs I.R.	5	480	0	0	0	480
Willamette N.F.	2	360	0	0	0	360
Siskiyou N.F.	3	130	0	0	0	130
Umatilla I.R.	1	55	0	0	0	55
Oregon areas	497	64,880	22,500	9,895	1,120	98,395
Washington:						
Yakima I.R.	13	9,560	0	0	0	9,560
Glenwood District (W.S.D.N.R.)	10	5,860	3,000	0	0	8,860
Okanogan N.F.	13	5,545	1,960	0	0	7,505
Wenatchee N.F.	13	6,165	720	0	0	6,885
Gifford Pinchot N.F.	5	3,840	0	0	0	3,840
Colville N.F.	2	2,160	0	0	0	2,160
Colville I.R.	3	320	0	0	0	320
Umatilla N.F.	1	80	0	0	0	80
N.E. Wash. Dist. (W.S.D.N.R.)	1	65	0	0	0	65
Washington areas:	61	33,595	5,680	0	0	39,275
Regional total	558	98,475	28,180	9,895	1,120	137,670

1/ N.F., National Forest; O.S.D.F., Oregon State Department of Forestry; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

FIR ENGRAVER
Scolytus ventralis Lec.

After five consecutive years of increase, the acreage of fir engraver infestations declined considerably this year (table 17). Declines were general over the Region with the exception of the Fremont National Forest in Oregon and the Wenatchee and Okanogan National Forests in Washington (table 18). On these forests the infestation acreage doubled. Much of the damage occurred in defective overmature trees and low value stands at high elevations. However, some occurred in vigorous young stands. Outbreaks generally develop during periods of drought and subside rapidly when moisture conditions return to normal. The beetle will attack some trees and produce broods without killing the tree. Because of this, control is impractical. These attacks kill strips of the cambium and introduce decay organisms. The resulting defects adversely affect the quality of lumber produced. Salvage of infested trees is recommended to recover timber values that would otherwise be lost.

Table 17.--Trend of fir engraver infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestations		Regional total
	Oregon	Washington	
1960	27,240	14,680	41,920
1961	43,720	17,800	61,520
1962	105,450	22,820	128,270
1963	58,280	15,865	74,145

Table 18.--Extent of fir engraver beetle infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Fremont N.F.	87	8,235	13,455	10,290	1,130	33,110
Umatilla N.F.	63	5,395	3,015	250	0	8,660
Wallowa-Whitman N.F.	81	6,575	1,750	50	0	8,375
Ochoco N.F.	21	1,400	440	0	0	1,840
Malheur N.F.	24	1,170	440	195	0	1,805
Central Ore. (O.S.D.F.)	15	980	600	0	0	1,580
Winema N.F.	7	740	305	0	0	1,045
Willamette N.F.	8	320	280	60	0	660
Mt. Hood N.F.	7	620	0	0	0	620
Deschutes N.F.	5	425	0	0	0	425
Rogue River N.F.	3	80	0	0	0	80
Warm Springs I.R.	1	50	0	0	0	50
Crater Lake N.P.	1	30	0	0	0	30
Oregon areas	323	26,020	20,285	10,845	1,130	58,280
Washington:						
Wenatchee N.F.	20	2,880	1,440	720	0	5,040
Okanogan N.F.	14	4,195	0	0	0	4,195
Umatilla N.F.	10	2,645	960	0	0	3,605
Mt. Baker N.F.	5	280	660	0	0	940
Snoqualmie N.F.	4	160	245	480	0	885
Colville N.F.	7	880	0	0	0	880
Gifford Pinchot N.F.	1	160	0	0	0	160
Yakima I.R.	1	160	0	0	0	160
Washington areas	62	11,360	3,305	1,200	0	15,865
Regional totals	385	37,380	23,590	12,045	1,130	74,145

1/ N.F., National Forest; O.S.D.F., Oregon State Department of Forestry; I.R., Indian Reservation; N.P., National Park.

OREGON PINE IPS
Ips oregonis (Eichh.)

Region-wide damage was less extensive in 1963 (table 19). Infestations in Washington increased slightly while those in Oregon decreased. The largest and most severe losses occurred on the dry sites on the Malheur and Wallowa-Whitman National Forests in Oregon and on the Yakima Indian Reservation in Washington (table 20).

No control is needed in 1964 because populations build up and subside rapidly. Good management practices usually preclude the need for direct control measures.

Table 19.--Trend of Oregon pine ips infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	38,160	3,360	41,520
1961	15,880	7,560	23,440
1962	43,610	1,970	45,580
1963	15,580	2,600	18,180

Table 20.--Extent of Oregon pine ips infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Malheur N.F.	70	1,830	1,720	1,600	0	5,150
Wallowa-Whitman N.F.	31	1,700	1,570	140	0	3,410
Fremont N.F.	17	1,675	220	0	0	1,895
Winema N.F.	12	1,435	360	0	0	1,795
Umatilla N.F.	21	1,240	230	0	0	1,470
Mt. Hood N.F.	14	550	0	20	0	570
Deschutes N.F.	4	90	240	0	0	330
Rogue River N.F.	5	245	0	0	0	245
Central Ore. (O.S.D.F.)	4	225	0	0	0	225
Ochoco N.F.	7	150	70	0	0	220
Warm Springs I.R.	4	190	0	0	0	190
Siskiyou N.F.	1	80	0	0	0	80
Oregon areas	190	9,410	4,410	1,760	0	15,580
Washington:						
Yakima I.R.	1	0	1,160	0	0	1,160
Okanogan N.F.	4	150	440	0	0	590
Umatilla N.F.	4	155	360	0	0	515
Colville N.F.	3	200	0	0	0	200
Glenwood Dist. (W.S.D.N.R.)	2	45	90	0	0	135
Washington areas	14	550	2,050	0	0	2,600
Regional total	204	9,960	6,460	1,760	0	18,180

1/ N.F., National Forest; O.S.D.F., Oregon State Department of Forestry; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources

SILVER FIR BEETLES
Pseudohylesinus spp.

Losses increased considerably in 1963 (table 21). Epidemic outbreaks developed at several localities in the Pacific silver fir stands of Washington (table 22) where heavy losses occurred on the Mt. Baker National Forest. Moderate losses also occurred on the Snoqualmie National Forest. In Oregon losses were below reportable damage limits. No practical direct control methods have been developed. Prompt salvage of infested trees and dead timber is the only known means of reducing beetle populations and losses. In many of the distressed trees root rot fungi and flatheaded borers were commonly associated with the beetles. The contributing influence of these two agents to mortality of the trees is unknown.

Table 21.--Trend of silver fir beetle infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestations		Regional total
	Oregon	Washington	
1960	0	3,120	3,120
1961	480	3,040	3,520
1962	480	0	480
1963	0	54,840	54,840

Table 22.--Extent of silver fir beetle infestations in Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Washington:						
Mt. Baker N.F.	34	29,000	14,840	7,280	0	51,120
Snoqualmie N.F.	9	1,205	2,160	0	0	3,365
Gifford Pinchot N.F.	1	0	200	0	0	200
Mt. Rainier N.P.	2	155	0	0	0	155
Total	46	30,360	17,200	7,280	0	54,840

1/ N.F., National Forest; N.P., National Park.

DOUGLAS-FIR ENGRAVER BEETLE
Scolytus unispinosus Lec.

The amount of young Douglas-fir killed by these beetles was relatively low this year and little changed from last year. In Oregon small epidemic outbreaks developed on dry sites on the Wallowa-Whitman, Siskiyou, and Mt. Hood National Forests. Minor outbreaks were limited to the Snoqualmie, Olympic, and Umatilla National Forests in Washington (table 23). Infestations of this beetle often develop during periods of drought, but quickly subside when moisture conditions return to normal. Control is not necessary in 1964.

Table 23.--Extent of Douglas-fir engraver infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	4	380	0	0	0	380
Siskiyou N.F.	1	125	0	0	0	125
Mt. Hood N.F.	1	120	0	0	0	120
Oregon areas	6	625	0	0	0	625
Washington:						
Snoqualmie N.F.	1	40	0	0	0	40
Olympic N.F.	1	40	0	0	0	40
Umatilla N.F.	1	20	0	0	0	20
Washington areas	3	100	0	0	0	100
Regional total	9	725	0	0	0	725

1/ N.F., National Forest.

ENGELMANN SPRUCE BEETLE
Dendroctonus engelmanni Hopk.

The trend of Engelmann spruce beetle infestations was slightly upward over the Region (table 24). Increases in infested acreage were moderate in Washington but slight in Oregon. Increases were most noticeable on the Okanogan and Snoqualmie National Forests in Washington and on the Wallowa-Whitman and Umatilla National Forests of Oregon (table 25). Much of the affected timber is located in inaccessible areas and in small isolated patches where the danger of a major epidemic developing is low. No major control is necessary in 1964. However, salvage of currently infested trees is desirable in accessible areas.

Table 24.--Trend of Engelmann spruce beetle infestations in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	1,840	3,120	4,960
1961	2,560	5,000	7,560
1962	1,230	6,280	7,510
1963	4,115	11,015	15,130

Table 25.--Extent of Engelmann spruce beetle infestations in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	28	2,125	570	0	0	2,695
Umatilla N.F.	5	420	1,000	0	0	1,420
Oregon areas	33	2,545	1,570	0	0	4,115
Washington:						
Okanogan N.F.	13	3,375	1,520	0	0	4,895
Umatilla N.F.	28	4,040	0	0	0	4,040
Snoqualmie N.F.	3	1,480	0	0	0	1,480
Wenatchee N.F.	3	600	0	0	0	600
Washington areas	47	9,495	1,520	0	0	11,015
Regional total	80	12,040	3,090	0	0	15,130

1/ N.F., National Forest

TWIG BEETLE
Pityophthorus sp.

Lateral and terminal twigs on both mature and immature Douglas-fir trees were attacked and killed by an undescribed species of Pityophthorus in the vicinity of Salem, Oregon. Low tree vigor during the last several years of drought may have been a contributing factor in causing the attack. Control is unnecessary since the damage is apparently not critical.

RED TURPENTINE BEETLE
Dendroctonus valens Hopk.

Above normal attacks of this insect occurred in progressive thinning study plots in young ponderosa pine on Snow Creek, Deschutes National Forest, Oregon. These plots were thinned in the fall of 1962 with residual trees of 8-10 inch D.B.H. spaced at 16 foot intervals. The attacks ranged from one to 16 per tree. Some tree mortality is likely to result where attacks were heavy. No control is needed in 1964.

OTHER FOREST PROBLEMS

DYING HEMLOCK

The acreage of mature western hemlock dying from unknown causes decreased sharply from that recorded last year (table 26). In Washington, the heaviest centers of damage were on the Olympic and Mt. Baker National Forests and in Olympic National Park. Less extensive losses occurred on the Snoqualmie National Forest and on the Quinault Indian Reservation. In Oregon, mature and overmature hemlock stands in northwest Oregon sustained some light losses (table 27). No control has been developed. Salvage logging is recommended in distressed areas to prevent excessive timber loss through wood decay.

Table 26.--Trend of dying western hemlock in Oregon and Washington, 1960-63

(In acres)

Year of detection	Area of damage		Regional total
	Oregon	Washington	
1960	2,000	33,120	35,120
1961	480	353,040	353,520
1962	1,280	223,680	224,960
1963	3,820	160,320	164,140

Table 27.--Extent of dying hemlock in Oregon and Washington in 1963, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of damage: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
N.W. Oregon (O.S.D.F.)	2	2,860	960	0	0	3,820
Oregon areas	2	2,860	960	0	0	3,820
Washington:						
Olympic N.F.	35	53,680	27,040	0	0	80,720
Mt. Baker N.F.	35	16,760	20,880	5,120	0	42,760
Olympic N.P.	15	19,680	12,800	0	0	32,480
Snoqualmie N.F.	4	2,400	160	0	0	2,560
Quinault I.R.	1	1,800	0	0	0	1,800
Washington areas	90	94,320	60,880	5,120	0	160,320
Regional total	92	97,180	61,840	5,120	0	164,140

1/ N.F., National Forest; I. R., Indian Reservation; N. P., National Park; O. S. D. F., Oregon State Department of Forestry.

BEAR DAMAGE

The extent of bear damage in young Douglas-fir and western hemlock stands decreased moderately in Oregon and increased sharply in Washington (table 28). In Oregon, the bulk of the damage occurred in young, understocked stands on the Siuslaw National Forest and in northwest Oregon. In Washington, tree killing increased substantially in understocked stands on the Olympic, Gifford Pinchot, and Snoqualmie National Forests, and on the Southwest Washington District (table 29). Cooperative research is now underway on the bear problem to find ways to control the animals and prevent damage.

Table 28.--Trend of bear damage in western Oregon and western Washington, 1960-63

(In acres)

Year of detection	Area of damage		Regional total
	Oregon	Washington	
1960	33,720	18,980	52,700
1961	129,920	113,400	243,320
1962	109,700	27,405	137,105
1963	65,540	150,070	215,610

Table 29.--Extent of bear damage in Oregon and Washington in 1963, by reporting area and intensity of damage

Reporting area[1/]	Infestation centers	Intensity of damage: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
N.W. Oregon (O.S.D.F.)	39	20,420	10,040	2,150	0	32,610
Siuslaw N.F.	78	17,260	9,580	970	0	27,810
Mt. Hood N.F.	7	2,440	285	0	0	2,725
Willamette N.F.	15	2,195	50	0	0	2,245
Umpqua N.F.	3	150	0	0	0	150
Oregon areas	142	42,465	19,955	3,120	0	65,540
Washington:						
Olympic N.F.	39	40,200	12,440	6,320	840	59,800
Gifford Pinchot N.F.	48	23,930	7,740	4,710	240	36,620
S. W. Washington (W.S.D.N.R.)	37	19,800	10,520	3,480	760	34,560
Snoqualmie N.F.	11	8,120	9,240	1,370	0	18,730
Quinault I.R.	1	360	0	0	0	360
Washington areas	136	92,410	39,940	15,880	1,840	150,070
Regional total	278	134,875	59,895	19,000	1,840	215,610

1/ N.F., National Forest; I. R., Indian Reservation, O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Natural Resources.

APPENDIX

Organization and Conduct of the Aerial Survey

The aerial survey of timberlands in Oregon and Washington was a cooperative undertaking by the Oregon State Department of Forestry, Washington State Department of Natural Resources, and United States Forest Service. Region-wide detection survey flights were made between July 9 and August 29. Special detection flights were made in early June in northeastern Washington to detect and evaluate outbreaks of the larch casebearer. In late October and early November other special flights were made in western Oregon and Washington to detect western hemlock looper defoliation.

This year personnel from State and Federal agencies accompanied the regular flight crew on detection flights over their respective administrative areas. This gave the managing forester a better understanding of his forest pest problems. Flying time required to complete all surveys totaled 317.3 hours (table 30).

Table 30.--Summary of cooperative aerial survey activities in 1963

Area covered	Timber area surveyed	Survey flight time		
		Mapping	Ferrying	Total
	M Acres	- - - - Hours - - - -		
Western Oregon	14,815	59.7	13.5	73.2
Eastern Oregon	12,492	77.7	15.7	93.4
Western Washington	13,069	79.0	10.6	89.6
Eastern Washington	11,660	46.2	14.9	61.1
All areas	52,036	262.6	54.7	317.3

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestations: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Crater Lake N.P.:						
Balsam woolly aphid	3	1,680	0	0	0	1,680
Mountain pine beetle (L)	23	1,180	0	0	0	1,180
Douglas-fir beetle	1	30	0	0	0	30
Fir engraver	1	30	0	0	0	30
All insects	28	2,920	0	0	0	2,920
Central Oregon (O.S.D.F.)						
Fir engraver	15	980	600	0	0	1,580
Western pine beetle	10	510	220	0	0	730
Mountain pine beetle (P)	13	665	0	0	0	665
Oregon pine ips	4	225	0	0	0	225
Douglas-fir beetle	6	110	0	0	0	110
All insects	48	2,490	820	0	0	3,310

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestations: Light	Moderate	Heavy	Very heavy	All intensities
	Number			Acres		
Deschutes N.F. and adjacent forest lands:						
Balsam woolly aphid	50	14,120	4,435	860	220	19,635
Mountain pine beetle (L)	22	6,690	2,700	940	0	10,330
Mountain pine beetle (W)	11	1,525	0	0	0	1,525
Mountain pine beetle (P)	4	195	40	40	0	275
Western pine beetle	24	2,890	60	0	0	2,950
Fir engraver	5	425	0	0	0	425
Oregon pine ips	4	90	240	0	0	330
All insects	120	25,935	7,475	1,840	220	35,470
Fremont N.F. and adjacent forest lands:						
Spruce budworm	12	37,040	0	0	0	37,040
Western pine beetle	88	25,110	10,595	7,080	1,120	43,905
Fir engraver	87	8,235	13,455	10,290	1,130	33,110
Mountain pine beetle (L)	19	7,730	2,530	2,510	620	13,390
Mountain pine beetle (P)	38	2,875	1,445	645	0	4,965
Oregon pine ips	17	1,675	220	0	0	1,895
All insects	261	82,665	28,245	20,525	2,870	134,305

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestations: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Malheur N.F. and adjacent forest lands:						
Western pine beetle	136	11,015	3,780	0	0	14,795
Oregon pine beetle	70	1,830	1,720	1,600	0	5,150
Fir engraver	24	1,170	440	195	0	1,805
Mountain pine beetle (P)	39	1,425	335	0	0	1,760
Mountain pine beetle (L)	9	290	160	160	0	610
Douglas-fir beetle	10	235	0	0	0	235
All insects	288	15,965	6,435	1,955	0	24,355
Mt. Hood N.F. and adjacent forest lands:						
Balsam woolly aphid	23	9,180	690	0	0	9,870
Mountain pine beetle (W)	57	20,880	9,910	7,860	1,120	39,770
Western pine beetle	7	1,530	0	0	0	1,530
Fir engraver	7	620	0	0	0	620
Oregon pine ips	14	550	0	20	0	570
Douglas-fir engraver	1	120	0	0	0	120
All insects	109	32,880	10,600	7,880	1,120	52,480
Bear damage	7	2,440	285	0	0	2,725
All damage	116	35,320	10,885	7,880	1,120	55,205

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963; by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Northwest Oregon and adjacent forest lands: (O.S.D.F.)						
Western hemlock looper	6	200	0	340	0	540
All insects	6	200	0	340	0	540
Bear damage	39	20,420	10,040	2,150	0	32,610
Dying hemlock	2	2,860	960	0	0	3,820
All damage	47	23,480	11,000	2,490	0	36,970
Ochoco N.F. and adjacent forest lands:						
Western pine beetle	61	3,020	2,020	0	0	5,040
Fir engraver	21	1,400	440	0	0	1,840
Douglas-fir beetle	12	700	160	0	0	860
Mountain pine beetle (P)	20	700	0	0	0	700
Oregon pine ips	7	150	70	0	0	220
All insects	121	5,970	2,690	0	0	8,660

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestations: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Rogue River N.F. and adjacent forest lands:						
Balsam woolly aphid	2	5,970	410	220	0	6,600
Western pine beetle	29	2,475	1,950	0	0	4,425
Douglas-fir beetle	53	3,075	480	0	0	3,555
Mountain pine beetle (P)	12	460	480	0	0	940
Mountain pine beetle (L)	2	360	0	0	0	360
Oregon pine ips	5	245	0	0	0	245
Fir engraver	3	80	0	0	0	80
All insects	106	12,665	3,320	220	0	16,205
Siskiyou N.F. and adjacent forest lands:						
Douglas-fir beetle	8	320	0	0	0	320
Western pine beetle	3	130	0	0	0	130
Douglas-fir engraver	1	125	0	0	0	125
Oregon pine ips	1	80	0	0	0	80
All insects	13	655	0	0	0	655

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Siuslaw N.F. and adjacent forest lands:						
Western oak looper	29	6,120	3,990	4,760	1,880	16,750
Balsam woolly aphid	8	4,030	0	0	0	4,030
Douglas-fir beetle	19	455	85	0	0	540
All insects	56	10,605	4,075	4,760	1,880	21,320
Bear damage	78	17,260	9,580	970	0	27,810
All damage	134	27,865	13,655	5,730	1,880	49,130
Umatilla I.R.						
Douglas-fir beetle	2	80	0	0	0	80
Western pine beetle	1	55	0	0	0	55
All insects	3	135	0	0	0	135

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963; by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Umatilla N.F. and adjacent forest lands:						
Contarinia sp.	1	40	0	0	0	40
Fir engraver	63	5,395	3,015	250	0	8,660
Western pine beetle	43	3,885	1,180	0	0	5,065
Mountain pine beetle (P)	36	2,645	440	0	0	3,085
Mountain pine beetle (L)	14	1,800	225	0	0	2,025
Douglas-fir beetle	30	1,560	0	0	0	1,560
Oregon pine ips	21	1,240	230	0	0	1,470
Engelmann spruce beetle	5	420	1,000	0	0	1,420
All insects	213	16,985	6,090	250	0	23,325
Umpqua N.F. and adjacent forest lands:						
Unknown sawfly (K)	8	2,000	4,200	1,240	0	7,440
Balsam woolly aphid	7	10,060	1,280	490	0	11,830
Douglas-fir beetle	33	4,105	0	0	0	4,105
Mountain pine beetle (W)	25	1,865	1,230	260	0	3,355
Mountain pine beetle (L)	4	250	1,200	180	560	2,190
Mountain pine beetle (P)	6	590	240	0	0	830
Western pine beetle	8	1,260	0	0	0	1,260
All insects	91	20,130	8,150	2,170	560	31,010
Bear damage	3	150	0	0	0	150
All damage	94	20,280	8,150	2,170	560	31,160

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Wallowa-Whitman N.F. and adjacent forest lands:						
Spruce budworm	1	9,640	2,360	0	0	12,000
Unknown sawfly (Larch)	3	170	400	0	0	570
Unknown mite (Douglas-fir)	9	19,980	8,240	2,880	0	31,100
Contarinia sp.	1	65	0	0	0	65
Mountain pine beetle (P)	91	7,840	7,545	2,700	600	18,685
Mountain pine beetle (L)	25	1,760	710	170	0	2,640
Douglas-fir beetle	121	8,535	3,820	160	0	12,515
Fir engraver	81	6,575	1,750	50	0	8,375
Western pine beetle	36	4,070	440	0	0	4,510
Oregon pine ips	31	1,700	1,570	140	0	3,410
Engelmann spruce beetle	28	2,125	570	0	0	2,695
Douglas-fir engraver	4	380	0	0	0	380
All insects	431	62,840	27,405	6,100	600	96,945
Blowdown	1	130	0	0	0	130
All damage	432	62,970	27,405	6,100	600	97,075

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Warm Springs I.R.						
Balsam woolly aphid	8	3,180	200	0	0	3,380
Western pine beetle	5	480	0	0	0	480
Oregon pine ips	4	190	0	0	0	190
Mountain pine beetle (P)	1	160	0	0	0	160
Mountain pine beetle (L)	2	85	0	0	0	85
Mountain pine beetle (W)	1	80	0	0	0	80
Fir engraver	1	50	0	0	0	50
Douglas-fir beetle	1	20	0	0	0	20
All insects	23	4,245	200	0	0	4,445
Willamette N.F. and adjacent forest lands:						
Balsam woolly aphid	94	37,445	6,395	870	0	44,710
Mountain pine beetle (W)	122	15,050	4,970	2,480	0	22,500
Mountain pine beetle (L)	4	355	0	0	0	355
Fir engraver	8	320	280	60	0	660
Douglas-fir beetle	11	410	0	0	0	410
Western pine beetle	2	360	0	0	0	360
All insects	241	53,940	11,645	3,410	0	68,995
Bear damage	15	2,195	50	0	0	2,245
All damage	256	56,135	11,695	3,410	0	71,240

See footnotes at end of table.

Table 31.--Extent of infestations in Oregon in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number			Acres		
Winema N.F. and adjacent forest lands:						
Pandora moth	1	3,480	240	80	0	3,800
Balsam woolly aphid	1	410	0	0	0	410
Mountain pine beetle (L)	54	11,240	4,865	360	590	17,055
Mountain pine beetle (W)	3	615	0	0	0	615
Mountain pine beetle (P)	2	155	0	0	0	155
Western pine beetle	44	8,090	2,255	2,815	0	13,160
Oregon pine ips	12	1,435	360	0	0	1,795
Fir engraver	7	740	305	0	0	1,045
Douglas-fir beetle	3	205	0	0	0	205
All insects	127	26,370	8,025	3,255	590	38,240

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; W, western white pine.

2/ Administrative areas are abbreviated as follows: N.F., National Forest; I.R., Indian Reservation; N.P., National Park; O.S.D.F., Oregon State Department of Forestry.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Colville I.R.						
Douglas-fir beetle	12	9,220	1,600	640	0	11,460
Mountain pine beetle (L)	2	280	200	0	0	480
Western pine beetle	3	320	0	0	0	320
All insects	17	9,820	1,800	640	0	12,260
Colville N.F. and adjacent forest lands:						
Douglas-fir tussock moth	2	0	280	0	0	280
Douglas-fir beetle	39	6,560	1,680	0	0	8,240
Mountain pine beetle (L)	9	520	1,160	2,680	0	4,360
Mountain pine beetle (P)	2	200	0	0	0	200
Western pine beetle	2	2,160	0	0	0	2,160
Fir engraver	7	880	0	0	0	880
Oregon pine ips	3	200	0	0	0	200
All insects	64	10,520	3,120	2,680	0	16,320

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Gifford Pinchot N.F. and adjacent forest lands:						
Balsam woolly aphid	36	59,735	4,120	80	0	63,935
Mountain pine beetle (W)	77	42,530	37,040	15,720	3,040	98,330
Mountain pine beetle (L)	3	4,680	640	3,640	0	8,960
Western pine beetle	5	3,840	0	0	0	3,840
Douglas-fir beetle	4	1,800	0	80	0	1,880
Silver fir beetles	1	0	200	0	0	200
Fir engraver	1	160	0	0	0	160
All insects	127	112,745	42,000	19,520	3,040	177,305
Bear damage	48	23,930	7,740	4,710	240	36,620
All damage	175	136,675	49,740	24,230	3,280	213,925
Glenwood District and adjacent lands W.S.D.N.R.:						
Western pine beetle	10	5,860	3,000	0	0	8,860
Oregon pine ips	2	45	90	0	0	135
Douglas-fir beetle	1	90	0	0	0	90
All insects	13	5,995	3,090	0	0	9,085

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Kaniksu N.F. and adjacent forest lands:						
Spruce budworm	4	6,480	3,720	0	0	10,200
Larch casebearer	8	4,660	150	160	1,300	6,270
Douglas-fir tussock moth	2	35	0	0	30	65
Mountain pine beetle (W)	3	250	1,040	0	0	1,290
Mountain pine beetle (L)	2	600	0	0	0	600
Douglas-fir beetle	1	160	0	0	0	160
All insects	20	12,185	4,910	160	1,330	18,585
Mt. Baker N.F. and adjacent forest lands:						
Silver fir beetles	34	29,000	14,840	7,280	0	51,120
Mountain pine beetle (W)	49	20,570	18,890	3,600	0	43,060
Fir engraver	5	280	660	0	0	940
Douglas-fir beetle	2	400	0	0	0	400
All insects	90	50,250	34,390	10,880	0	95,520
Dying hemlock	35	16,760	20,880	5,120	0	42,760
All damage	125	67,010	55,270	16,000	0	138,280

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Mt. Rainier N.P.:						
Balsam woolly aphid	6	2,935	320	0	0	3,255
Mountain pine beetle (W)	17	5,620	1,720	2,400	0	9,740
Silver fir beetles	2	155	0	0	0	155
All insects	25	8,710	2,040	2,400	0	13,150
N. E. Washington:						
Larch casebearer	36	17,280	3,600	6,280	3,600	30,760
Douglas-fir tussock moth	15	535	290	30	315	1,170
Western pine beetle	1	65	0	0	0	65
Douglas-fir beetle	1	60	0	0	0	60
All insects	53	17,940	3,890	6,310	3,915	32,055

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Okanogan N.F. and adjacent forest lands:						
Douglas-fir beetle	74	26,150	4,760	1,040	0	31,950
Western pine beetle	13	5,545	1,960	0	0	7,505
Engelmann spruce beetle	13	3,375	1,520	0	0	4,895
Fir engraver	14	4,195	0	0	0	4,195
Mountain pine beetle (L)	5	1,200	0	0	0	1,200
Mountain pine beetle (W)	2	1,005	0	0	0	1,005
Oregon pine ips	4	150	440	0	0	590
All insects	125	41,620	8,680	1,040	0	51,340
Olympic N.F. and adjacent forest lands:						
Mountain pine beetle (W)	11	6,240	15,360	1,480	520	23,600
Mountain pine beetle (L)	4	160	520	0	0	680
Douglas-fir beetle	2	120	0	0	0	120
Douglas-fir engraver	1	40	0	0	0	40
All insects	18	6,560	15,880	1,480	520	24,440
Dying hemlock	35	53,680	27,040	0	0	80,720
Bear damage	39	40,200	12,440	6,320	840	59,800
All damage	92	100,440	55,360	7,800	1,360	164,960

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Olympic N.P.:						
Mountain pine beetle (W)	31	71,800	37,640	5,040	120	114,600
Douglas-fir beetle	2	320	0	0	0	320
All insects	33	72,120	37,640	5,040	120	114,920
Dying hemlock	15	19,680	12,800	0	0	32,480
All damage	48	91,800	50,440	5,040	120	147,400
Quinault I.R.:						
Mountain pine beetle (W)	7	6,600	440	0	0	7,040
All insects	7	6,600	440	0	0	7,040
Dying hemlock	1	1,800	0	0	0	1,800
Bear damage	1	360	0	0	0	360
All damage	9	8,760	440	0	0	9,200

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Snoqualmie N.F. and adjacent forest lands:						
Balsam woolly aphid	25	9,360	1,200	0	0	10,560
Mountain pine beetle (W)	67	19,050	10,605	2,285	120	32,060
Silver fir beetles	9	1,205	2,160	0	0	3,365
Engelmann spruce beetle	3	1,480	0	0	0	1,480
Fir engraver	4	160	245	480	0	885
Douglas-fir beetle	5	850	0	0	0	850
Douglas-fir engraver	1	40	0	0	0	40
All insects	114	32,145	14,210	2,765	120	49,240
Dying hemlock	4	2,400	160	0	0	2,560
Bear damage	11	8,120	9,240	1,370	0	18,730
All damage	129	42,665	23,610	4,135	120	70,530
Spokane I.R.:						
Douglas-fir beetle	1	65	0	0	0	65
All insects	1	65	0	0	0	65

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number			Acres		
S. W. Washington (W.S.D.N.R.)						
Western hemlock looper	20	3,960	1,360	2,280	440	8,040
All insects	20	3,960	1,360	2,280	440	8,040
Bear damage	37	19,800	10,520	3,480	760	34,560
All damage	57	23,760	11,880	5,760	1,200	42,600
Umatilla N.F. and adjacent forest lands:						
Engelmann spruce beetle	28	4,040	0	0	0	4,040
Fir engraver	10	2,645	960	0	0	3,605
Oregon pine ips	4	155	360	0	0	515
Douglas-fir beetle	5	335	170	0	0	505
Mountain pine beetle (P)	8	345	90	0	0	435
Mountain pine beetle (L)	4	195	0	0	0	195
Western pine beetle	1	80	0	0	0	80
Douglas-fir engraver	1	20	0	0	0	20
All insects	61	7,815	1,580	0	0	9,395

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Wenatchee N.F. and adjacent forest lands:						
Balsam woolly aphid	2	600	0	0	0	600
Mountain pine beetle (W)	97	41,080	24,805	11,280	2,120	79,285
Mountain pine beetle (P)	1	520	0	0	0	520
Mountain pine beetle (L)	4	345	45	0	0	390
Western pine beetle	13	6,165	720	0	0	6,885
Fir engraver	20	2,880	1,440	720	0	5,040
Douglas-fir beetle	17	3,670	200	280	130	4,280
Engelmann spruce beetle	3	600	0	0	0	600
All insects	157	55,860	27,210	12,280	2,250	97,600

See footnotes at end of table.

Table 32.--Extent of infestations in Washington in 1963, by forest area, insect species and intensity of infestation (Cont.)

Reporting area and insects involved[1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Yakima I. R.						
Balsam woolly aphid	2	5,480	680	800	0	6,960
Western pine beetle	13	9,560	0	0	0	9,560
Oregon pine ips	1	0	1,160	0	0	1,160
Mountain pine beetle (L)	4	635	0	0	120	755
Mountain pine beetle (W)	5	445	0	90	0	535
Douglas-fir beetle	1	320	0	0	0	320
Fir engraver	1	160	0	0	0	160
All insects	27	16,600	1,840	890	120	19,450

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; W, western white pine.

2/ Administrative areas are abbreviated as follows: N.F., National Forest; I. R., Indian Reservation; N.P., National Park; W.S.D.N.R, Washington State Department of Natural Resources.

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270